NUCLEAR KID

Taylor Wilson is a nuclear scientist—and he's only 18 years old

Ever since Taylor Wilson was 9, he's been fascinated by nuclear energy. For his fifth-grade science project, he borrowed a *Geiger counter* from emergency officials in his hometown of Texarkana, Arkansas. He wanted to use the device to try to detect radioactive materials in everyday objects.

Taylor went to antique stores and passed the Geiger counter over various items, listening for a telltale tick-tick-tick. (That sound signals that something nearby is releasing *radiation*, invisible high-energy particles and waves.) He found that some old bright-red dishes and clocks with glow-in-the-dark dials were painted with radioactive chemicals.

"It opened up a world that was previously unknown to me at that point," says Taylor. "Radiation is all around us, and you can find it just about anywhere you go."

Taylor's interest in all things radioactive kept building. By age 14, he'd become the youngest person ever to build a *nuclear fusion reactor*. Inside this device, a controlled reaction takes place, producing energy as two atoms of radioactive material combine.

Next, Taylor invented an antiterrorism device to detect radiation from nuclear weapons. That won him a $50,000 prize at the 2011 Intel International Science and Engineering Fair.

Today, at 18, Taylor is conducting research at the University of Nevada, starting his own company, and working on a way to make radiation treatment for cancer available to patients in remote parts of the world. And he has an even bigger project in mind: finding a way to provide enough clean, safe energy for everyone on Earth.

DANGEROUS HOBBY

Radiation makes a lot of people nervous. It's powerful and invisible, and exposure to too much can be deadly. But it can also be harnessed to run nuclear power plants or kill cancer cells.

RADIATION DETECTOR: Taylor uses a Geiger counter to find remnants of nuclear bombs tested in New Mexico.

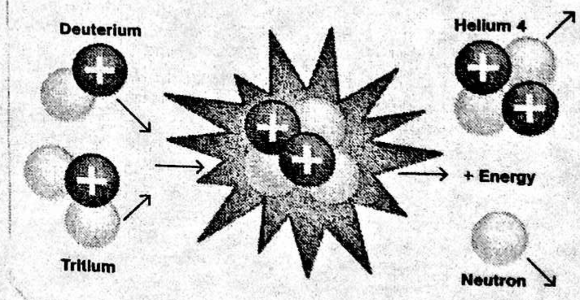
RECOGNIZING TALENT: President Obama listened to Taylor explain his research last year at the second White House Science Fair.

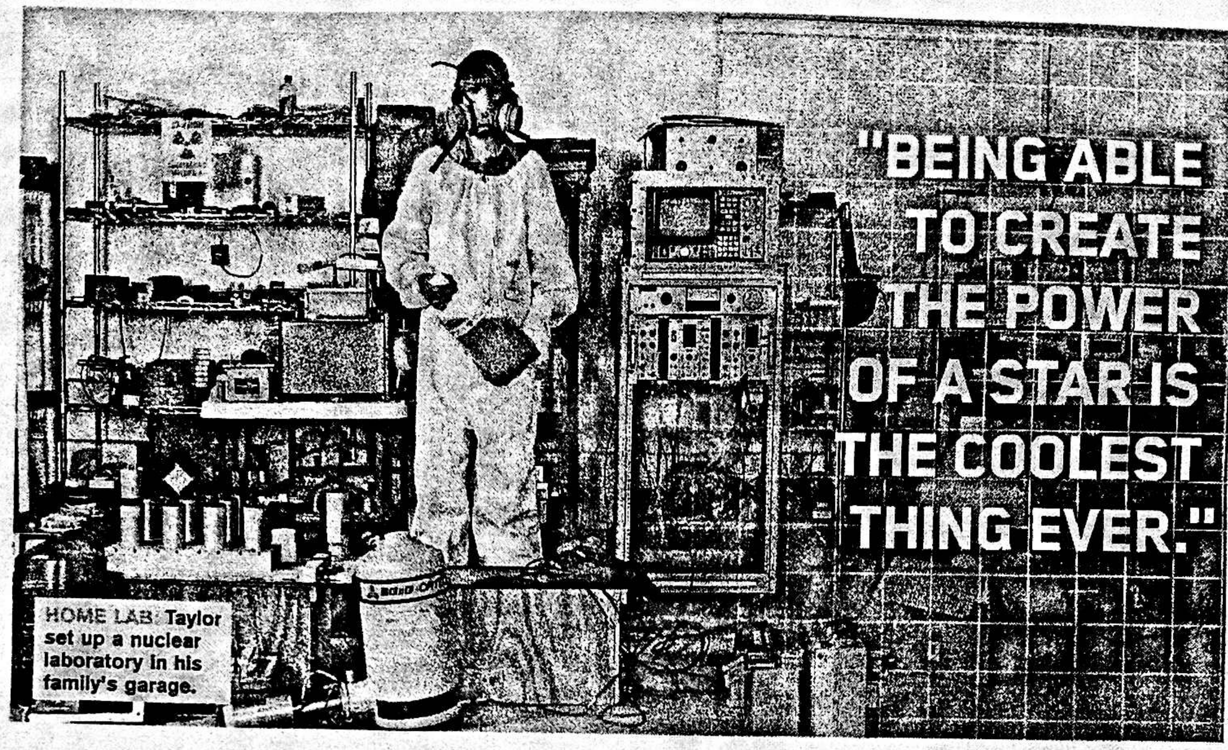
"Being able to wield that [energy] is awe-inspiring," he says. "The only way for me to do that was to build a fusion reactor."

When Taylor was 14, he enrolled in The Davidson Academy, a public school in Reno, Nevada, for the nation's brightest kids. It was then

HOW FUSION WORKS

The most common fusion reaction uses two hydrogen *isotopes*—versions of the element with different numbers of neutrons in their *nuclei*, or centers—as fuel. When deuterium's and tritium's nuclei fuse, a helium isotope is created, along with energy in the form of a neutron.





HOME LAB: Taylor set up a nuclear laboratory in his family's garage.

that Taylor started building a reactor in his parents' garage.

When a professor from the University of Nevada learned of Taylor's work, he helped him set it up somewhere safer—a sub-basement in the university's physics department. There, Taylor could work behind a lead shield, which blocks harmful radiation. He also wore a badge, called a *dosimeter*, which monitored his radiation exposure. After months of hard work, his reactor was complete.

GOING NUCLEAR

A fusion reaction combines atoms to make heavier atoms of a different element. During the process, the atoms' *nuclei*, or centers, fuse. This releases energy (*see How Fusion Works, p. 21*). By contrast, a fission reaction (the kind that powered the first atomic bombs and occurs at today's nuclear power plants) splits atoms to release energy.

It takes a lot of energy to get the nuclei of two atoms close enough to fuse; in nature, the energy required to fuse atoms is found only inside stars. In the 1950s, scientists began testing ways to create fusion on Earth. "Being able to create the power of a star is the coolest thing ever," says Taylor.

Taylor's reactor uses intense magnetic fields to speed up hydrogen atoms and smash them together. The atoms move so fast that when they collide, their nuclei fuse, producing a new atom of helium. Depending on the conditions of the reaction, some *neutrons*, or uncharged particles found in an atom's nucleus, also fly off as radiation. The power of fusion reactors comes from harnessing the energy of those speeding neutrons.

TACKLING TOUGH PROBLEMS

After seeing nuclear energy's potential firsthand, Taylor wanted to use that power to help people. "I'm passionate about changing the world and making changes in what I see as big problems, like medicine and energy," he says.

Taylor is using fusion reactions to produce *isotopes* used in medical imaging and radiation therapy for cancer. Isotopes are versions of atoms of the same element with different numbers of neutrons in their nuclei. Taylor is working on a portable reactor that will allow hospitals without access to isotopes to make their own.

Taylor's biggest goal—and the longtime dream of many nuclear scientists—is to use fusion to make electricity. A dangerous by-product of the fission process in today's nuclear power plants is radioactive *nuclear waste*, which can take hundreds of thousands of years to decay. But a fusion reactor using water as fuel wouldn't produce any waste.

So far, all the fusion reactors that have been developed, including Taylor's, require more energy to run than they can produce. Taylor hopes to change that. How long will it take to achieve this goal?

"There's a joke in fusion research that fusion energy is 30 years away and it always will be 30 years away," says Taylor. He adds with a laugh, "I hope to be the driving force that makes it happen in the next 30 years."

—*Chris Jozefowicz*

WHAT DO YOU THINK?
Should a teen be allowed to build a nuclear reactor? Use details from the article to explain why this is safe or unsafe.

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